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ABSTRACT (MAXIMUM 200 WORDS) COUNTERINSURGENCY OPERATIONS REQUIRE A TAILORED AVIATION UNIT TO MAINTAIN PERSISTENCE AGAINST THE ENEMY. THE FIELDING OF TILT-ROTOR TECHNOLOGY HAS PROVIDED THE MARINE CORPS WITH A NICHE CAPABILITY, AND A MULTI-ROLE AIRCRAFT WITH EXTRAORDINARY GROWTH POTENTIAL. AUGMENTED WITH ADVANCED SENSORS AND PRECISION WEAPONS, THE MV-22 CAN PROVIDE THE ACE WITH AN ADDITIONAL PLATFORM TO MAINTAIN CONTINUOUS SURVEILLANCE AND IMMEDIATELY PROSECUTE TARGETS THROUGHOUT A LARGE AMOUNT OF BATTLESPACE. THIS COMBINATION WILL PROVIDE AN ADDITIONAL FIRE SUPPORT ASSET TO SUPPORT DISTRIBUTED OPERATIONS, ASSAULT SUPPORT AND GROUND CONVOY ESCORT, AND AN ECONOMY OF FORCE TO THE AIR COMBAT ELEMENT.			
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MASTER OF MILITARY STUDIES

MV-22: A Hybrid, Multi-Role Aircraft for the Complex Battlefields of the Future

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENT FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

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Executive Summary

Title: MV-22: A Hybrid, Multi-Role Aircraft for the Complex Battlefields of the Future

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Thesis: Utilizing a mission kit consisting of an advanced sensor and low yield precision guided munitions, the Osprey can support the Marine Air Ground Task Force's (MAGTF) scheme of maneuver by providing a multi-faceted airborne platform capable of surveillance, reconnaissance, and responsive fires throughout an expansive battle space.

Discussion: America's involvement in the worldwide struggle against violent extremism has highlighted that the aircraft flying in support of counterinsurgency (COIN) operations require tailored weapons, systems, and sensors. The aircraft supporting those ground forces must possess unique characteristics to effectively support and prosecute targets in this fight. Additionally, all air components must continue to prepare and be capable of executing conventional operations in the future. Attack assets are tasked to support these missions, and it is taking its toll on aircraft and aircrew; increasing fatigue life counts on airframes, and eliminating training opportunities for aircrew. Proponents of a dedicated COIN aircraft argue that jets are not optimized to perform CAS in support of COIN operations, and have cited the success of the T-6 Texan, A-1D Skyraider, and OV-10 Bronco in previous conflicts. A compelling argument is made for the next generation of these aircraft which will possess similar performance to their predecessors but be armed with today's surveillance and low yield weapons technology.

The fielding of the MV-22 Osprey has introduced an evolutionary operating capability to the Marine Corps. Additionally, it possesses all of the desired operating characteristics that are sought after in a COIN fighter, and has the payload to expand its mission beyond its current role of Assault Support. The Osprey can aid the Air Combat Element (ACE) in providing constant coverage, and crews possess detailed familiarity of large amounts of battle space – a combination of fixed and rotary wing pilots.

Conclusion: The Osprey configured with a mission kit that consists of an advanced sensor such as the Lockheed Target Sight System (TSS), low yield precision guided munitions such as Griffin and/or Viper Strike, and a modified 30MM cannon will provide the USMC with an additional multi-role asset that will be integral to current COIN operations and future conventional conflicts. This basic mission kit will turn the Osprey into a force multiplier that provides persistence and flexibility against the hybrid threats that the MAGTF will face in the future.

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THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

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Preface

As a Harrier pilot since 1999, I have had the opportunity to observe the incorporation of many new sensors, weapons, and systems fielded by the Marine Corps to assist warfighters during the past nine years of conflict. One of the most important in my field was the addition of the Litening II targeting pod to the AV-8B; sealing its role as a vital attack asset to execute conventional and COIN operations and highlighting the capability it provides to the Ground Combat Element. In response to the recent calls for a dedicated, light attack counterinsurgency aircraft, I believe that the Marine Corps can fill the requirement with the MV-22 Osprey. This paper is by no means a call to change the core mission of the Osprey squadron or that it should fill missions instead of other aircraft. My goal of writing the paper was to highlight that the evolutionary capability of the aircraft combined with the latest sensors, low yield precision weapons, and network technology could significantly increase the coverage and effectiveness the Air Combat Element can provide to the Ground Combat Element. In my research, I also discovered that the kitted up Osprey could perform some missions better than the aircraft currently executing them. I truly hope I have highlighted the requirement for this capability, uniqueness of the aircraft, and a springboard for future development.

I would like to thank Lieutenant General Trautman, Brigadier General Davis, Colonel Claypool, Lieutenant Colonels Freeland and Page, Majors Sanders, Brown and Bedell, Bill Sunick and Larry Outlaw for their insight, assistance, and candor regarding the current aircraft programs and future technologies. I'd also like to thank Dr. Douglas E. Streusand and Dr. Paul Gelpi for their mentorship and patience.

Introduction

America's involvement in the global struggle against violent extremism has highlighted the unique requirement for aviation forces supporting counterinsurgency (COIN) operations to possess aircraft with tailored weapons, systems, and sensors that provide versatility to effectively combat the enemy. The *Marine Corps Vision and Strategy 2025* states, "Our Marine Air Ground Tasks Forces (MAGTFs) must be decisive across the range of military operations with their capacity tailored to combatant commanders' requirements...optimize(d) for operations against hybrid threats¹ in complex environments without sacrificing conventional capabilities."² As America's expeditionary force in readiness, the Marine Corps must optimize all of its systems and the tasks assigned to Marine Aviation include: "enhance the ability to employ organic and joint all weather fires with greater precision and responsiveness to exploit the fleeting opportunities found in hybrid warfare³ and identify the way ahead for enabling the MAGTF with advanced, persistent surveillance, and reconnaissance over extended ranges and in complex operating environments."⁴

Marine Aviation is no stranger to optimizing its resources. Capitalizing on the lessons learned from World War II, the Corps transformed its aviation assets from a force consisting of mostly fighter aircraft to flying F4U-1D Fighter-Bombers almost exclusively. Training and equipment was tailored to support the infantry, and when the Korean War broke out in 1950 the Marines were "CAS (Close Air Support) specialists who were well prepared to fight."⁵ After arriving in Korea, AC-47 aircraft were modified with mission kits and acted as an airborne Tactical Air Direction Center (TADC); the early version of the Direct Air Support Center – Airborne (DASC(A)).⁶ In Vietnam, "the requirement for the UH-1 Huey to have self protection and close in fire support capability resulted in some UH-1's being configured as gunships; this

aircraft was incredibly successful and remains a cornerstone of Marine Aviation today.”⁷ Similar to battles past, Marine Aviation has realized the unique aspect of supporting COIN operations and has gone to great lengths at equipping all of its aviation assets with the most advanced weapons, systems, and sensors to support Ground Combat Element (GCE).

Operations Enduring Freedom (OEF) and Iraqi Freedom (OIF), along with the normal Marine Expeditionary Unit (MEU) and Unit Deployment Program (UDP) rotations, have placed an increased amount of flight hours and fatigue on all of the Corps’ Type/Model/Series (TMS) aircraft and aircrew. “All Marine Corps aircraft in support of overseas contingency operations are exceeding programmed rates, and are thus consuming service life at a rate sometimes three times higher than that scheduled for the lifetime of the aircraft.”⁸ Squadrons have expanded their capabilities and focus to support COIN operations and perform a wide range of skills to include Non-Traditional Intelligence, Surveillance, and Reconnaissance (NTISR), Convoy Escort, and Improvised Explosive Device (IED) detection/disruption. Fourth generation sensors and low yield precision guided munitions (PGM’s) have increased the effectiveness of aviation assets involved in COIN operations. Fixed Wing (FW) assets have used their data link capable Litening II targeting pods, to stream video to Remote Operated Video Enhanced Receiver (ROVER) laptop stations, providing commanders with real time feedback of the battlefield. This capability is evolving daily, but the benefits include the capability to map enemy patterns that results in a faster kill chain due to continuous coverage of the target. United States Marine Corps (USMC) aviators and aircrew have done an exceptional job of adapting to the ever changing Tactics, Techniques, and Procedures (TTP’s) and are consistently striving to enhance the methods in which the ground forces are supported. It is essential that the capabilities of all Marine Aviation assets be exploited, so that the enemy can be “struck while he is most vulnerable...by the air

patrol which discovers him.”⁹

In 2006, as a part of Project Air Force, the Rand Corporation stated that the “USAF (United States Air Force) is using aircraft designed for other needs for COIN missions, but that aircraft specifically geared for such needs would be better.”¹⁰ While that may work for extended land operations, none of the fixed wing COIN aircraft proposed today can operate from the Amphibious Assault ships that the MAGTF will be expected to operate from and the aircraft could lack effectiveness in future conventional conflicts. Therefore, in keeping with Marine Corps amphibious doctrine and in line with the *Strategy and Vision 2025*, a mission kit should be engineered to provide the MV-22 Osprey the capability to provide enhanced ISR, limited weapons capability, and an upgraded Command and Control (C2) suite. Utilizing a mission kit consisting of an advanced sensor and low yield precision guided munitions, the Osprey can support the MAGTF’s scheme of maneuver by providing a multi-faceted airborne platform capable of surveillance, reconnaissance, and responsive fires throughout an expansive battle space.

Airpower in support of COIN Operations

Aircraft supporting COIN operations must be capable of long loiter times, operating from austere airfields, roads, or landing sites, employing low yield weapons, a fourth generation sensor capable of ISR, targeting, and marking, and they must have the systems and survivability to operate in the medium and low altitude environment. America’s involvement in COIN operations in Iraq and Afghanistan has produced an enormous outcry from analysts, aviators, and even ground commanders for Light Attack Aircraft (LAA) to support ground troops and help train and equip Foreign Internal Defense (FID) forces. Two examples cited are the French

involvement in Algeria and the U.S. involvement in Vietnam and all authors noted the exceptional performance of aircraft such as the T-6 Texan, A-1 Skyraider, OV-10 Bronco, UH-1 Huey, and AH-1 Cobra. The French were able to maintain pressure on the enemy with hundreds of propeller driven aircraft such as the T-6 to perform Armed Reconnaissance and CAS as well as helicopters to rapidly move ground troops throughout the battle space.¹¹ In Vietnam, despite the misapplication of air power strategy and inter-service rivalries that resulted in the U.S. applying a conventional model to an unconventional enemy,¹² tactical level successes were common. LAA operating throughout Vietnam were especially successful in operations such as FARMGATE and the Navy's OV-10 squadron supporting patrol boats, special operations, and South Vietnamese units in the Mekong Delta.

In his article, "Air Power in a Low Intensity Conflict in the Middle East," published in the *Air University Review*, Dr. William Olson sums up the problem and reason for a dedicated fixed wing, turboprop COIN aircraft very succinctly. "The use of high-speed, high-performance aircraft and heavy ordnance, like the indiscriminant use of long-range artillery, is counterproductive. Targets are difficult to identify, distinguishing friend from foe is largely a matter of chance, and time on station is too ephemeral. What are needed are slow planes that can be directed discriminatingly by ground observers who have an understanding of the situation."¹³ Modern day jet fighters are equipped with advanced targeting pods capable of far superior detection and identification than ever before and armed with an array of precision weapons that preclude collateral damage in all environments. Nevertheless, the combination of operating altitude, airspeed, time on station (TOS), and pilot workload, does not allow the FW aviator to become as intimately familiar with the GCE's Area of Operation (AO) as the rotary wing (RW) or tilt rotor aviator.

To support Army ground forces, special operations, and Foreign Internal Defense (FID) requirements, Aeronautical Systems Center (ASC) Capabilities Integration Directorate is conducting market research analyses in support of the acquisition of a fixed-wing Light Attack/Armed Reconnaissance (LAAR) capability capable of “conducting day/night/NVD (night vision device) operations from semi-prepared surfaces and forward bases, with GPS navigation capability, 270 horizontal degree field of view from the front cockpit, a radar warning receiver (RWR), missile approach warning system (MAWS), chaff and flare dispensers, armored cockpits, and self-sealing fuel tank.”¹⁴ The document goes on to require 5.0 hour sorties, data link ability, video downlink capability compatible with Remote Operations Video Enhanced Receiver (R.O.V.E.R.), ISR targeting pod, aerial gunnery capability, and capable of employing a variety laser guided, GPS guided, general purpose bombs, rockets, and aerial delivered illumination up to an employment altitude of 10,000 feet AGL.¹⁵

In arguing for this additional capability, modern aircraft such as the AT-6 Texan II, the Embraer (EMB)-314 Super Tucano, and the OV-10X Super Bronco have been suggested. The United States Navy is currently testing the EMB - 314 as part of the Imminent Fury program; the program is designed to evaluate the suitability of a LAA to support Naval Special Warfare units and is scheduled to deploy operationally in 2010.¹⁶ These aircraft have the performance and loiter capability of their predecessors with precision, low collateral damage weapons, 20-30MM gun capability, advanced ISR/targeting pods, the capability to view feeds and control Remotely Piloted Aircraft (RPA) and the avionics to operate in the net centric environment of today’s battlefield. These aircraft are also equipped with the latest survivability equipment, Missile Approach Warning Systems (MAWS), and possibly Directional Infrared Countermeasures (DIRCM) system which makes them much more survivable than their predecessors against Man

Portable Air Defense Systems (MANPADS); specifically the systems that have seen employment in Iraq and Afghanistan. Additionally, the LAA will be operating in the heart of their maneuverability envelope and will be able to execute maximum performance defensive maneuvers if fired upon by the enemy. Currently, and in past COIN operations, jet counterparts have been operating well below maneuvering speed to provide increased TOS, which placed them at a severe disadvantage if engaged by surface threats.

In recent testimony before the House Appropriations Committee, the Secretary and Chief of Staff of the USAF testified that between now and 2013 the Air Force will procure Light Mobility and LAA to continue to build partner nation capabilities.¹⁷ “These aircraft will provide effective and affordable capabilities in the two most critical mission areas for partner air forces: lower-cost airlift and light strike/reconnaissance training.”¹⁸ There is no indication that the USAF plans to procure a dedicated COIN aircraft, and according to the testimony, their focus remains on RPA and enhancing the capabilities of their existing assets. In the *2010 Marine Aviation Plan*, the Deputy Commandant for Aviation (DCA), Lieutenant General George Trautman, states that we must “improve warfighting integration by developing new concepts of operation to leverage our transformational systems. We are not interested in aircraft for their own sake; we are interested in the *capabilities* those aircraft provide in support of our ground forces” and “[S]hort Takeoff / Vertical Landing (STOVL) capabilities bring unprecedented responsiveness to the fight.”¹⁹

“Air forces succeed when they are able to organize, train and equip themselves properly for both the current and future fights and purposefully build in the flexibility to operate across the spectrum of conflict and deliver effects at all level of war – tactical, operational, and strategic.”²⁰ Current operations in Afghanistan have resulted in ground units spread over a

widely dispersed battle space and in some cases isolated due to terrain. Additionally, restrictive Rules of Engagement (ROE) have placed increased emphasis on low collateral damage weapons. The USMC *Small Wars Manual* states that “(t)he employment of aviation in small wars is characterized by the operation of many small units...over a wide area.”²¹ The manual goes on to describe that twice the number of reconnaissance aircraft will be required and that the targets will be fleeting and “time may not permit the dispatch of regular attack units.”²² The manual, originally printed in 1940, has particular applicability to Afghanistan, where the wide dispersal of ground troops to expeditionary firebases demand that “the Air Combat Element (ACE) be capable of forming semi-permanent detachments in support of dislocated companies to provide assault support, rotary wing close air support, and casualty evacuation.”²³ In operations outside of Afghanistan, in line with the Operational Maneuver From the Sea (OMFTS) doctrine and Distributed Operations, Marine Companies, Platoons, and Rifle squads may find themselves in a region of instability hundreds of miles from their sea base, particularly since the fielding of the tilt rotor MV-22. It is also not unrealistic that the group of Marines would have limited options when it comes to fire support.

In order to quickly prosecute targets in the complex environment or provide actionable intelligence to higher headquarters, aircrew must be “intimately familiar with their zones of interest” and either overhead or in close proximity to the critical areas where ground commanders expect contact.²⁴ An ACE comprised of multiple attack assets, FW, RW, and tilt rotor, would ensure coverage in conjunction with, and outside of, the dedicated Airborne Alert CAS (XCAS), NTISR, or Reconnaissance missions. By outfitting “every platform with a sensor,”²⁵ and increasing the number of fire support assets, the ACE can “destroy the enemy while he is either conducting an attack or attempting to flee afterward (and producing) the

desired effect of making guerrilla attacks seem dangerous and unproductive to would-be attackers.”²⁶

Fighting “The Long War”

“The exceptional operational value of Air Force ISR assets has led Joint force commanders in Iraq, Afghanistan, and the Horn of Africa to continually increase their requests for these forces and the Air Force increased the number of remotely piloted aircraft (RPA) fielded by 330 percent.”²⁷ Additionally the Air Force’s “Project Liberty” program has outfitted 37 C-12 aircraft with advanced systems and a sensor to perform dedicated ISR missions in permissive COIN operations.²⁸ FW CAS aircraft have flown around Iraq and Afghanistan with weapons such as the Laser Maverick, Low Collateral Damage Joint Direct Attack Munitions (JDAM), Laser Guided Bombs (LGB’s), rockets, and cannons ranging from 20-30MM. However, ground commanders often only require the sensor. Searching for rocket points of origin, monitoring on an objective, investigating areas of interest, as well as reconnoitering vast areas that can not be continuously covered by ground forces but where insurgents could find refuge, have been some of the many tasks conducted on CAS missions in OIF and OEF. This has placed an additional tax on CAS assets, while deployed in support of and while working up for extended deployments to Iraq and Afghanistan. Despite the enormous increase in the average flight time of aviators that have deployed in support of OEF and OIF, readiness, experience, and broader knowledge their Mission Essential Tasks Lists (METL’s) has suffered.

The real challenge for aviation units during deployments in support of COIN operations is not accomplishing the mission of NTISR, but keeping the unit proficient in the air to surface skills that may be required in a kinetic action. In a 2008 deployment to Iraq, Marine Attack

Squadron 311 flew over 3000 hours in support of OIF, but only dropped 3 bombs. It is a common theme throughout all communities that a repetitive mission, reduced time between deployments, and competing priorities between OIF/OEF and the normal MEU rotations results in a loss of corporate knowledge in a wider range of skill sets that may be required for future conventional conflicts. Additionally, squadrons must continue to train while in theater in case they are called upon to employ ordnance in what is arguably one of the more challenging environments due to civilian populace and collateral damage restrictions.

Extended support of the Long War also creates issues for the ground force especially when it comes to training Joint Terminal Attack Controllers (JTAC's). Since the Marine Corps is increasing the number of JTAC's to allow units to effectively execute distributed operations, the requirement to provide training sorties has increased. This levies an increased requirement on all attack assets to provide more CAS sorties to the GCE while resetting from one deployment and preparing for another. The challenge is that the attack squadrons need to simultaneously reset currency, gain proficiency, and expand the squadron's breadth of knowledge while training junior aviators. All aviation communities must also continue to build Instructor qualifications to train those junior aviators and the entire squadron by producing Weapons and Tactics Instructors (WTI's). The result is sorties, and entire skill sets are waived because of competing requirements, and the aircrew's knowledge of a wider array of skills as well as their capability to manage task saturation is reduced. In the future, increased cost per flight hour of all aircraft will highlight the need for more assets that can perform CAS for Tactical Air Control Party (TACP) training.

A possible solution is to create opportunity to conduct continuation training (CT) while deployed to locations such as Al Asad or Kandahar, in order to maintain proficiency in ordnance

employment and a broader range of Air to Surface skill sets. For example, if a Harrier squadron could conduct 10 continuation-training (CT) sorties per pilot throughout a deployment, that squadron would have approximately 180 sorties available to provide support upon their return to CONUS vice flying internal refresh events.²⁹ Also, increased exposure to a wider array of Air to Surface skill sets will increase the capability of the squadron's pilots to reconnoiter and prosecute targets in support of the GCE. The seven month deployment model to Iraq or Afghanistan does not support continued syllabus progression as deployments to Japan or aboard ship, but with minimal effort, the ACE can help alleviate some of the effects of extended combat operations in order to prepare for future conflicts.

Over the Horizon

“Activities in the combat operations line will require a force that at the execution level has discrete, proportionate fires and fire support capabilities at its timely disposal. Countering irregular threats will often involve small units operating with substantial independence over and operationally significant geographic expanse. To do this effectively these small units will need mobility platforms to move with relative freedom. These vehicles must support the command and control requirement as well as the logistical sustainment requirement of the force.”³⁰

The fielding of tilt rotor technology has given the MAGTF a true over the horizon assault support capability. With that, comes the realization that Ospreys may be tasked to insert Marines into a threat area without RW CAS assets on station. And if RW CAS assets are required, then they must conduct refueling via the Tactical Airfield Fuel Dispensing System (TAFDS) somewhere along their ingress. The difference between traditional long range helicopter raids and one involving the Osprey is en route escort is no longer required due to the altitude and speeds at which it will be flying, but “actions in the objective area must be coordinated.”³¹ The UH-1Y and AH-1Z provide an unprecedented expansion to Marine RW attack and Assault Support capability. But operating at great distances from the Amphibious Ready Group (ARG)

will require another platform for radio relay, and possibly security when conducting refueling operations in enemy territory.

Anticipating that the Osprey may be required to provide its own self-defensive measures in and out of the Landing Zone (LZ), the Remote Guardian system is in its infantile stages and currently deployed to Afghanistan as an Interim Defensive Weapons System (IDWS). Remote Guardian provides the aircraft with a 360-degree defensive capability provided by a 7.62 GAU-17 cued by a Charge Coupled Device (CCD) TV/FLIR that can detect tactical size targets up to 10 KM away. For target prosecution, the sensor has a laser range finding capability, and its identification capability extends out to 2 KM. A handheld device similar to a video game controller controls the sensor and the operator observes the video through a small display. (Appendix 1) Although the GAU-17 provides an impressive rate of fire, 2000-4000 rounds per minute, its effective range is limited to 1000 meters, and it is at best a suppressive system. The greatest weakness of the Remote Guardian system is that an independent and efficient target acquisition capability is non-existent. The pilots verbally orient the operator on to the target, and while it may be useful for monitoring an LZ and the area contained within the Field of View (FOV), to prosecute a target that is visually acquired by the pilots and achieve concurrence from the operator will take time that the assault package may not have. Additionally, acquiring a fleeting target or threat while the aircraft is maneuvering could be extremely difficult if not impossible.



Figure 1: MV-22 outfitted with Remote Guardian System

Evolutionary Capability

The fielding of the Osprey by the Marine Corps and Air Force Special Operations Command (AFSOC) has created a niche capability. The Osprey has the potential to aid in maintaining pressure against the enemy, and the fielding of a tandem seat tilt-rotor gunship would no doubt be the ideal COIN aviation asset of the future. The MV-22 possesses every characteristic of the ideal COIN aircraft and possesses greater operating flexibility due to its V/STOL capability. An Osprey outfitted with a tailored mission kit would be capable of performing limited Close Air Support (CAS), Assault Support, Assault Support Escort, ISR, and C2 while operating from any platform or location that the MAGTF will be expected to operate from or deploy.

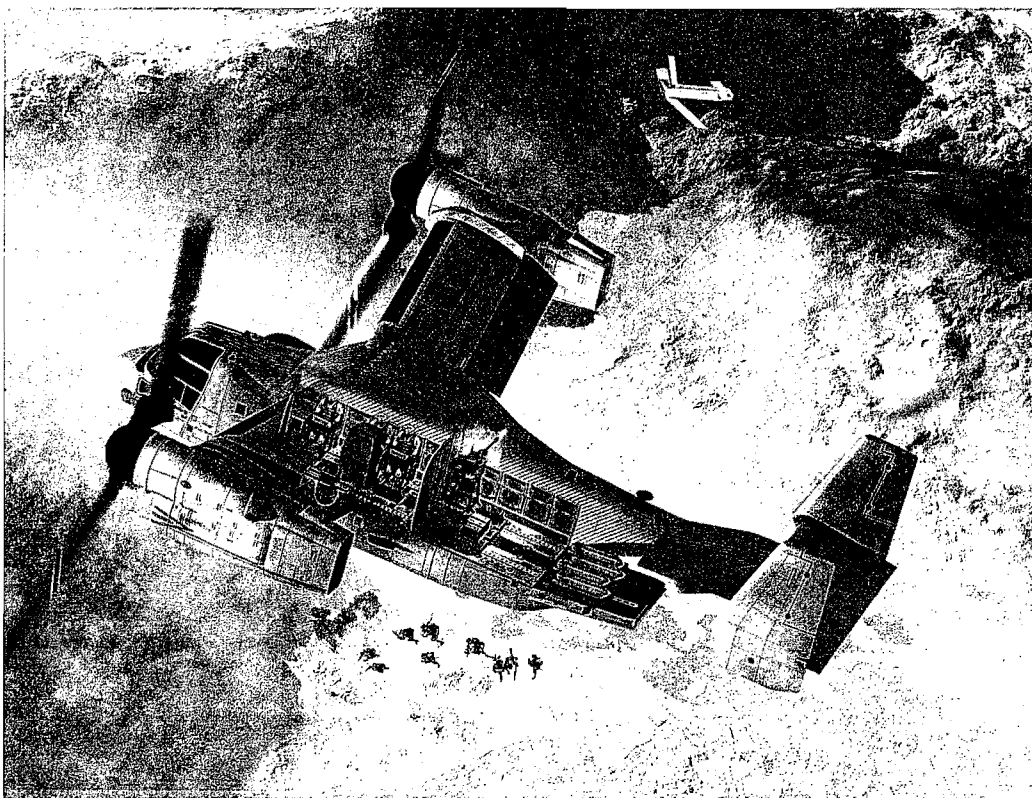


Figure 2: MV-22 with Remote Guardian, C2 station, M230 30MM chain gun, and Compressed Scan Eagle on ramp. - Courtesy of Bill Sunick, The Boeing Company

Capable of a 10K pound internal payload, the average unrefueled combat radius of an Osprey is 275 NM with 30 minutes of loiter time in the target area or 3.5 hours operating directly from a forward operating or fire base.³² The Osprey's loiter time is twice that of a Harrier or Hornet flying with external drop tanks and on a typical NTISR mission for the same amount of TOS, aerial refueling (AR) would only be required every 2-3 hours vice every hour. In this scenario, substituting an Osprey for a section of fighters would reduce the fuel required by 50 percent, and fall in line with the Commandant of the Marine Corps guidance to "lessen energy consumption and dependence on fossil fuels."³³

The Osprey is more survivable than its RW predecessors, and just as survivable as the turboprop LAA that have been proposed to fill the COIN fighter role. When compared to a CH-

46E, the infrared (IR) signature from its engines is four times lower, its acoustic signature is six times lower, and its ballistic tolerance against small arms rounds is seven times higher.³⁴ The Osprey's maximum speed is 280 knots, maximum cruise speed is 255 knots, and service ceiling is 24,700;³⁵ most fixed wing aircraft in support of COIN operations have been loitering over Iraq and Afghanistan well within these flight parameters. The Osprey possesses the latest technology in missile defense equipment to include the AN/ALE-47 countermeasures dispensing system, AN/APR-39 Radar Warning Receiver (RWR), and a MAWS. The On Board Oxygen Generation System (OBOGS) is capable of supporting four to seven crewmembers, and Osprey is suited to work in the 8-12,000 altitude blocks or in the higher elevations of areas such as Afghanistan.

The combination of Advanced Survivability Equipment, operating envelope, and advanced sensors that allow standoff, places the Osprey in the same category as the LAA, and the Osprey's RWR allows it to operate in the radar surface to air missile environment (a feature that most LAA do not possess). An Osprey equipped with a tailored mission kit would be capable of different missions depending on threat conditions. In the permissive environment and especially at night, the Osprey could loiter for an escort mission or extended on station times for outlying posts. Unlike the OV-10 in Desert Storm, where two Marine Broncos were lost to MANPADS, the Osprey would not have to depart sanctuary to acquire and prosecute targets, instead using an advanced sensor and precision guided munitions.³⁶ In a conventional fight with a more integrated air defense network, the Osprey may not act as a fire support asset, but use of the sensor could aid survivability by reconnoitering the LZ or NAI's and utilizing preplanned coordinates for its GPS guided weapons could provide suppression in and out of an LZ or a threat area.

The very nature of the Osprey's Assault Support mission exposes the aircrew to the entire

battle space and their transition to and from bases throughout the AO, combined with the capability to aerial refuel and loiter, provides the crews with the intimate knowledge that will cue them into suspicious activity in the area. During 2008, the ACE supporting OIF in Al Anbar was tasked to reconnoiter large areas of desert and areas where insurgents were penetrating the western border. An asset like the Osprey equipped with a fourth generation, data linked targeting pod could investigate Named Areas of Interest (NAIs), and download them to the regional ground forces while simultaneously conducting Assault Support. Also, if on a network or link, the Osprey could transmit images gathered with its sensor to other aircraft or higher headquarters, providing instantaneous intelligence to commanders or other CAS aircraft. This flexibility will allow commanders to relentlessly pursue insurgents and deny them the ability to rest or reorganize. The Osprey is the perfect solution to provide reactive fires or at a minimum monitor targets until CAS assets arrive. Once FW or RW CAS assets have arrived, the Osprey could transition to a battlefield coordinator and serve as a Tactical Air Controller – Airborne (TAC(A)) or Forward Air Controller – Airborne (FAC(A)) for any follow on aviation or indirect fires that were required.

An Osprey outfitted with a diverse mission kit would be a force multiplier for the ground commander on any battlefield. The V/STOL capability would allow a Battalion Air Officers, Forward Air Controllers (FACs), and Ground Commanders that are forward based to participate in missions inside their AO. The extended time over the operating area as well as the close coordination with the ground forces will give the Osprey crews unique familiarity with not only the geography but the insurgent patterns in the area. The end result is a much more defined picture of the enemy and the capability to identify him, eliminating “one of the most difficult links in the kill chain.”³⁷

An additional ISR and attack platform in the ACE can produce the economy of force so all squadrons can perform limited continuation training while deployed. An ideal mission that this Osprey could perform is Ground Convoy Escort. In the last seven years of OIF, FW aircraft have provided route reconnaissance and radio relay to multiple convoys moving throughout the AO. Although they have been invaluable at performing this mission, there has been never been a FW section employ heavy ordnance in support of these convoys in OIF and the real requirement has been for reconnaissance and radio relay. The Osprey equipped with a mission kit including advanced communications, network capability, and programs such as Blue Force Tracker would be ideal for this mission. The situational awareness of the crew would be higher than the FW and the Osprey could serve as a true battlefield coordinator working with the Unit Movement Control Center (UMCC) to provide routing or rerouting of convoys and immediate fire support or targeting to other assets that were called to support. Osprey could also provide instantaneous casualty evacuation in the event it was required.

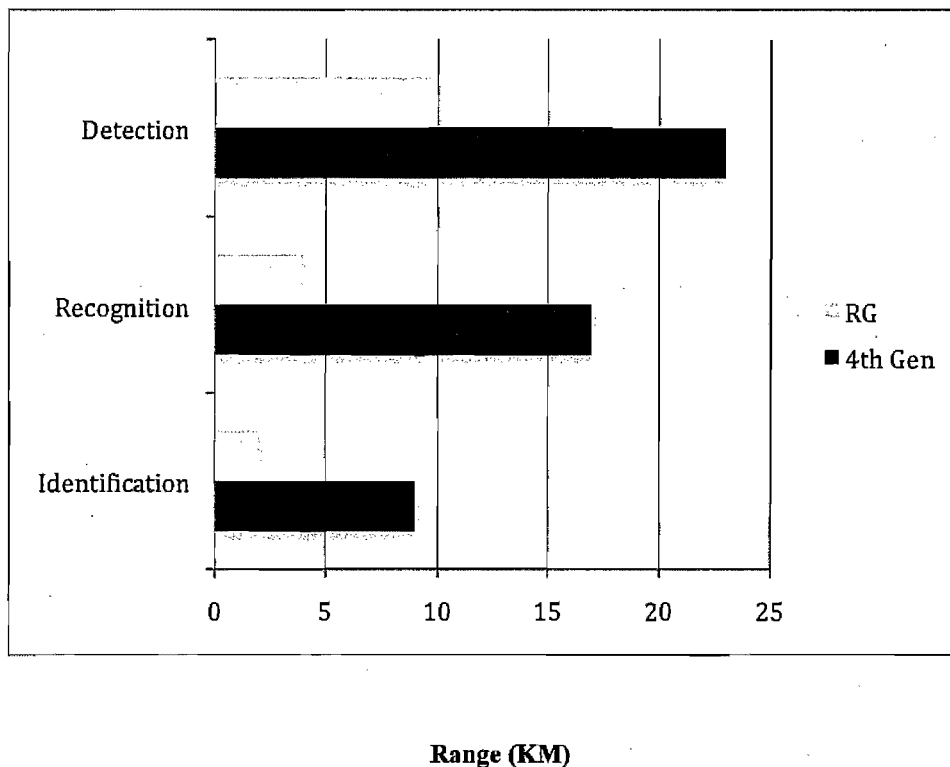
A mission kit equipped Osprey allows the ACE commander the flexibility of fires not only for Ospreys in and out of the objective area but also for any RW asset that is operating in the area. For the long-range helicopter raid mission, these Ospreys cannot only escort their own but provide C2, radio relay, and undetected surveillance of the LZ as other attack helicopters and assault support assets move to and from the refueling point and to the objective. The capability to operate at higher altitudes, above the threat and out of noise range while reconnoitering the LZ through on board sensors or remotely piloted aircraft feeds will enhance the probability of surprise of the assault package. The *Counterinsurgency* manual outlines that strike, intelligence, and airlift are advantages airpower brings to the fight and that insurgents must be struck “quickly

with precision fires.”³⁸ All of these are missions that could be performed in conjunction with its primary mission in COIN of “moving land forces where they are needed.”³⁹

The Mission Kit

Wray Johnson paraphrases Sir Robert Thompson’s points for fighting a counterinsurgency by stating that the strategy must be one that is “correct, sustainable, and plays for the breaks.”⁴⁰ A roll on/roll off mission kit tailored to support the ground force is just that. The nucleus of that mission kit is the fourth generation targeting pod to replace the current sensor that has been fielded with Remote Guardian. The ACE must continue to maximize the coverage that air assets provide in order to realize the greatest effects in support of ground forces. The ideal system to replace the current sensor would be the Lockheed Target Sight System (TSS), which is also being fielded on the AH-1Z. The incorporation of this advanced sensor will give the Osprey increased detection and range, as well as coordinate generation and marking capability. The TSS, like most 4th Generation sensors, possesses an infrared marker which facilitates much easier target acquisition while operating at night using NVD’s, and is an excellent target mark or tool to enhance the ground forces situational awareness. This sensor will also enhance survivability, and it would be capable of reconnoitering the LZ or objective while the assault package is in sanctuary. Fires could be called in on precise coordinates or laser marks, or PGM’s could be employed from the Osprey. Commonality amongst sensors will result in easier sustainment and the capability to share corporate knowledge across communities. This will also instantly add the Osprey to the list of platforms that can perform NTISR and the capability to mark for FW and RW assets as a Strike Coordination and Reconnaissance (SCAR) platform.

Table 1: Remote Guardian vs. Fourth Generation Targeting Pod



Source: HQMC Aviation

To achieve the greatest synergy, the Fire Control Officer (FCO) should be stationed in the jump seat in order to look outside to aid in acquisition and reduce time to get the sensor on target. The ideal solution is a helmet mounted cuing system for the pilot, and this would allow the sensor to be placed immediately on any target or threat, eliminating the “talk on” and reducing the time to kill.

In conjunction with the TSS, the GAU-21 gun turret would replace the GAU-17. The current Remote Guardian turret is currently rated to support a .50 caliber weapon and this will instantly double to triple the effective range of the Osprey’s gun system, and provide a more effective defensive weapon. “A .50 caliber round has the capability to pierce most brick buildings in addition to light armored vehicles,”⁴¹ and the range of the weapon will allow target

prosecution at increased range. The integration that the Remote Guardian provides will result in an extremely accurate, low collateral damage system, which could be used offensively if required.

In addition to the gun, the Griffin missile or Viper Strike would be incorporated and employed from the ramp. The Griffin is dual-mode, 33-pound missile with a 13-pound warhead capable of height of burst or point detonation.⁴² Coordinates are inputted directly to the missile from a laptop station and the missile is tube launched from the rear of the aircraft much like a parachute flare. The Viper Strike is a dual mode, 44-pound gravity weapon, with a 2.6-pound warhead and a 9:1 glide ratio.⁴³ Both weapons are GPS launched and can be terminally guided by a laser designator or will default to the coordinate if no laser is available. Both are capable of engaging moving targets and can be employed throughout the envelope of the MV-22. (Appendix 2 & 3) The Griffin can be equated to a 81MM mortar and the Viper Strike a hand grenade, and will give the aircraft an offensive capability that can be employed from altitude sanctuary.

The last weapon system that should be incorporated to give the Osprey a true “point and shoot” capability is the MK-44 Bushmaster cannon or M230 LF chain gun. Initial estimates by Boeing engineers reveal that both of these weapons systems will geometrically fit inside the aircraft, but in depth testing would need to be conducted to determine which system is best suited for the aircraft. The Bushmaster rate of fire is 200 rounds per minute, and is available in 25, 30, and 40 MM models.⁴⁴ The current version slated for the Expeditionary Fighting Vehicle has an 8,000-pound recoil, but in recent incorporation of the Rapid Airborne Mine Clearance System (RAMICS), engineers were able to lessen the recoil by engineering a robust ring spring recoil

mechanism in inside the cradle.⁴⁵ The result is recoil less than 4,000 PSI for a 30MM system that can be employed from the SH-60 helicopter.⁴⁶

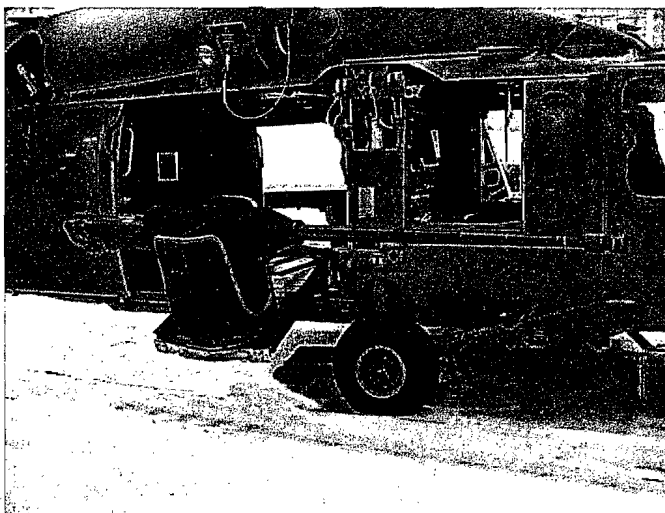


Figure 3: SH-60S configured with modified MK-44

“The M230 LF is the link fed version of the 30mm Apache helicopter Chain Gun cannon and is ideal for use on ground vehicles and patrol boats in turrets or remote weapon stations out to 4,000 meters.”⁴⁷ (Appendix 4) Placed in the cargo hold and oriented out of the right aft egress door, the cannon is the ideal weapon to provide sustained fires for Osprey self-escort or the instantaneous, low collateral damage fires in all environments. This caliber weapon has been extremely sought after in Iraq where General John Jumper noted a “surprising amount of strafing in support of operations in Fallujah, Iraq.”⁴⁸ The low yield destructive capability of the cannon is much desired by many ground commanders engaged in COIN operations, and in a 2009 deployment to Afghanistan, 60 percent of the kinetic engagements conducted by Marine Attack Squadron 214 utilized the 25MM cannon off of their AV-8B II.⁴⁹ Depending on the threat level, since the gun would be cued and/or slaved by the sensor, the gun system could be set up to employ on a strafing profile or employed from an overhead orbit during convoy escort or when orbiting an LZ.

During the 2010 Joint Expeditionary Fires Experiment, the Boeing Company plans to test a roll on/roll off C2 suite capable of long range data, satellite, and radio communications coupled with advanced navigation displays.⁵⁰ This communications suite would be the perfect addition to the mission kit whether it was on board the same aircraft or if operating in section, in the wingman's aircraft. With this additional capability and associated controller, the Osprey would be capable of performing all C2 functions in the target area, control or monitoring remotely piloted aircraft feeds, and could provide the conduit to transmit data from the ground forces back to their commander.

The Squadron

In a 2009 Marine Corps Gazette article concerning MV-22 escort, Major Douglas Sanders recommended that 4 of 12 aircraft in the Marine Medium tilt-rotor (VMM) squadron be converted to an armed variant. Although his concept was purely focused on escort, it is valid for incorporating the mission kit concept into the Osprey squadron. Depending on the assault support requirements, designated aircraft could easily stay configured to support sustained operations and training. Variations of the mission kit, with or without missiles or the cannon, with or without C2, would allow the Osprey to retain attack capability and integrate into the Assault Support package, or a fully armed section could provide dedicated escort, CAS, and C2 when required. Currently the Osprey squadron deployed to Afghanistan with eight aircraft is flying two sections per day and would possess, at a minimum, the capability to sortie another aircraft outfitted with the mission kit to provide escort or any number of the above capabilities. At a 75% readiness rate, this would leave another aircraft available to conduct escort of any assault packages. In any given fly day, two Ospreys could provide 12 hours of coverage with two refueling evolutions that consume an estimated 20K pounds of fuel versus a section of AV-

8's that would consume 32K of fuel for 6 hours of coverage. Additionally, the tanker asset would be on station for half of the time to support the Osprey vice the fighter aircraft. The addition of this rapidly reconfigurable capability to the VMM provides the ACE commander with an enhanced capability without diminishing the current depth in assault support.

Training

Ten percent of the pilots currently serving in the Osprey community have attack experience in Harriers, Hornets, Hueys, or Cobras.⁵¹ These aviators will form the baseline for helping the community assume additional ISR and light attack skill sets. The mission kit should be incorporated similar to the C130J Harvest Hawk, using qualified pilots and naval flight officers in the rear of the aircraft to serve as the Fire Control Officer (FCO). The FCO will be responsible for operating the sensor, generating coordinates, inputting coordinates into and firing any weapons systems. The Aircraft Commander would have final release/firing authority.

The Osprey crews would find their skill sets in the 400 level "core plus" section of the Training and Readiness manual. This provides commanders the capability to train only as required without it affecting the core skills proficiency of the unit. Just as certain crews are selected to advance in different areas, 8-10 aviators should be selected to progress through this syllabus. The training should mirror the current Harvest Hawk syllabus which details nine sorties at 4.0 hours a piece to attain proficiency in employing the sensor, PGM's, and performing Type 2 or 3 CAS.⁵² Marine Aviation and Tactics Squadron 1 would develop and establish pertinent tactics, techniques and procedures for ASE/Ground Escort and employment of the 30MM system. All aviators and FCO's designated to fly this aircraft should attend the FAC(A)

ground school provided by Expeditionary Warfare Training Group whether or not this capability is exploited in the community to gain exposure to Call for Fire procedures and CAS TTP's .

As the Marine Corps transitions its FW squadrons to a sole F-35 force, there may come a time where Weapons Systems Officers (WSO) and Electronic Counter Measures Officers (ECMO's) may still exist but have few options for employment in an operational squadron. If an Osprey mission kit could be fielded, these officers would be expertly suited to train and operate as FCO's in an Osprey squadron or as a part of the Marine Aircraft Group that contained the asset. In the case of the WSO, they are supporting arms subject matter experts and bring unparalleled knowledge from the F/A-18D community in FAC(A), TAC(A), and combined arms integration on the battlefield. ECMO's have unique experience in Electronic Warfare and Attack, and could only benefit the VMM with this knowledge in a conventional conflict or COIN operations should a jamming system similar to Intrepid Tiger be fielded on the Osprey. Recently, EA-6B's have also operated Litening II targeting pods to support NTISR requests in OIF, and ECMO's have begun to build corporate knowledge operating this targeting system. The Naval Flight Officer 'sundown' will leave a cadre of subject matter experts that would prove invaluable to the expanded role of the Osprey.

Conclusion

While exploring ways to proliferate intelligence and prosecute asymmetric threats in COIN and expand capabilities to support all aspects of the ground commander's scheme of maneuver, a unique capability emerges in tailored mission kits for the MV-22 Osprey. The Osprey is a transformational aircraft that can provide the MAGTF with a "precise, low to medium altitude, real time reactive, high fidelity sensor-human-weapon interface with a rapid relocation

capability”⁵³ in conventional or irregular warfare. Currently, Marine Corps strategy is “optimize to conduct naval expeditionary operations while retaining the institutional agility, battlefield flexibility, and initiative to meet constantly changing conditions of war;”⁵⁴ exploiting current aviation systems is an integral means to support the MAGTF to achieve that end state. Every air component in the US military needs to be prepared to engage against the hybrid threat posed by insurgents and terrorists. “Insurgencies remain a central feature of the international landscape and will continue to (be) for as long in the future as we can project.”⁵⁵ The USAF has modified current airframes with advanced sensors and is currently investigating LAA technology to train partner nation air forces. The Marine Corps has fielded data linked targeting pods and advanced low yield weapons and recently introduced the C-130J Harvest Hawk program. The Osprey equipped with a mission kit will maximize the ACE’s economy of force by providing all the benefits of the LAA with the additional capability of VSTOL and the survivability to conduct operations in an elevated threat environment. By utilizing mission kits, the need for an entirely new aircraft is eliminated, and tempo against insurgents is maintained through dedicated missions or during normal Assault Support missions conducted by the Osprey squadron.

Tilt rotor technology has opened up countless possibilities for Ship to Objective Maneuver and changes the paradigm of the Assault Support community. AFSOC is currently seeking to procure an offensive weapons system on the CV-22⁵⁶ and a long-term, dedicated tilt rotor attack platform is a program that all services should pursue for the future. Relevant missions for that platform include Light Attack CAS, Assault Support Escort, Maritime Interdiction, Convoy Escort, Special Forces support, and Combat Search and Rescue. Until that aircraft is a reality, the MV-22 is a flexible V/STOL aircraft that can perform C2, Aerial and Armed Reconnaissance, Helicopter and Convoy Escort, CAS, and Assault Support without

comprising or modifying the airframe. The MV-22 Osprey presented in this paper is the interim yet viable solution to many current and emerging issues facing Marine Aviation. The fielding of this multi-faceted aircraft will increase the lethality of MAGTF in all operating environments and provide responsive, precise, and persistent surveillance and fires to exploit the enemy on the complex battlefields of the future.

Notes

¹ “This emerging understanding is reflected in the National Maritime Strategy: Conflicts are increasingly characterized by a hybrid blend of traditional and irregular tactics, decentralized planning and execution, and non-state actors, using both simple and sophisticated technologies in innovative ways.” Frank Hoffman and Steve Zotti, *Hybrid Warfare and Challenges*, (information paper, February 12, 2008), 2.

² Headquarters U.S. Marine Corps, *Marine Corps Vision and Strategy 2025: Implementation and Planning Guidance*, (Washington, DC: U.S. Marine Corps), 10.

³ “Hybrid Wars combine a range of different modes of warfare including conventional capabilities, irregular tactics and formations, terrorist acts including indiscriminate violence and coercion, and criminal disorder. The adversary employs all forms of conflict, perhaps simultaneously to gain an advantage. These multi-modal conflicts can be conducted by separate units, or even by the same unit but are generally operationally and tactically directed and coordinated within the main battlespace to achieve synergistic effects.” Hoffman and Zotti.

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⁶ Charles Smith, *U.S. Marines in the Korean War*, (Washington, DC: History Division, U.S. Marine Corps, 2005), 638.

⁷ Douglas Sanders, “MV-22 Escort,” *Marine Corps Gazette*, August 2009, <http://proquest.com/>.

⁸ Senate Armed Services Committee, *Posture of the United States Marine Corps*, 111th Cong., 2nd sess., 2010, 9.

⁹ U.S. Marine Corps, *Small Wars Manual*, FMFRP 12-15 (Washington, DC: U.S. Marine Corps, 22 December 1990), p.9-16.

¹⁰ Michael Fabey, “Counter-Insurgency Urgency?” *Aviation Week and Space Technology*, Aug. 21-28, 2006, p.36.

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¹² Corum and Johnson, 274.

¹³ William Olsen, “Air Power in Low-Intensity Conflict in the Middle East”, *Air University Review*, (March-April 2006).

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¹⁶ Capt Mark Mullins, U.S. Navy Irregular Warfare Office, <http://www.scribd.com/doc/17581134/NXIrregular-Warfare-Office> (accessed March 15, 2010).

¹⁷ House Appropriations Committee, *Air Force Fiscal Year 2010 Budget*, 111th Cong., 2nd Sess., 2010, 17.

¹⁸ IBID

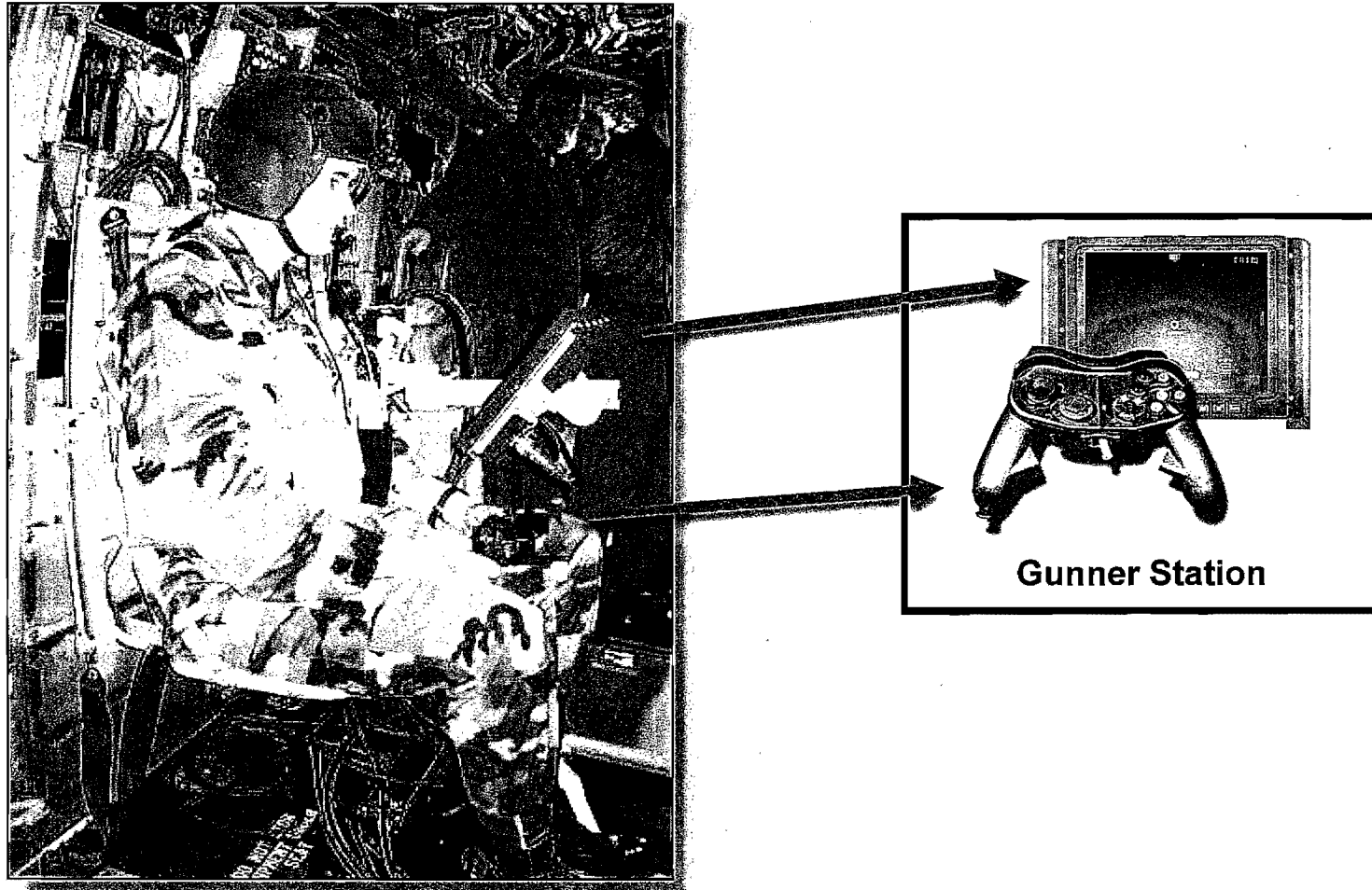
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²⁰ House Appropriations Committee, *Air Force Readiness*, 110th Cong., 1st sess., 2007, 2.

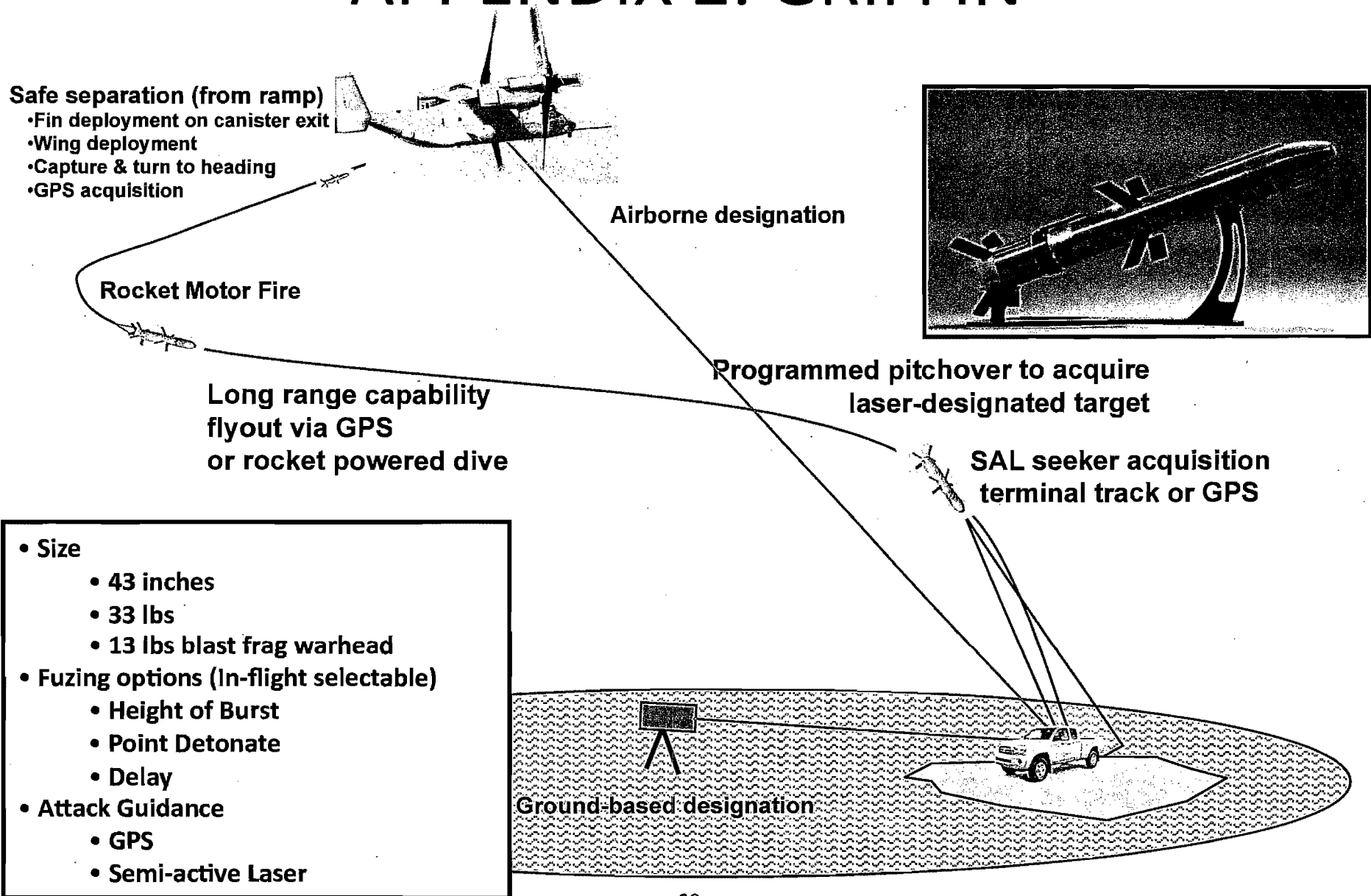
- ²¹ U.S. Marine Corps, *Small Wars Manual*, FMFRP 12-15 (Washington, DC: U.S. Marine Corps, 22 December 1990), p.9-1.
- ²² Ibid, p.9-3, 9-16.
- ²³ Norman Cooling, et al, "Retooling for Afghanistan", *Marine Corps Gazette*, Vol. 93, Iss. 10, (Oct. 2009), <http://www.proquest.com/>.
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Appendix 1: Remote Guardian Operator Station



APPENDIX 2: GRIFFIN



APPENDIX 3: VIPER STRIKE

State 2: Dispense (from ramp)

Munition rear jettison from tube,
GIRAS deployment

State 3: Configure

Deploy Wing/Tail/Primary Chute

State 4: Roll to Target Heading

Roll Stabilization

State 5: Pitch up to
Target Heading
Cut Primary Chute

State 6: GPS Fly-Out

State 1: Pre-Dispense

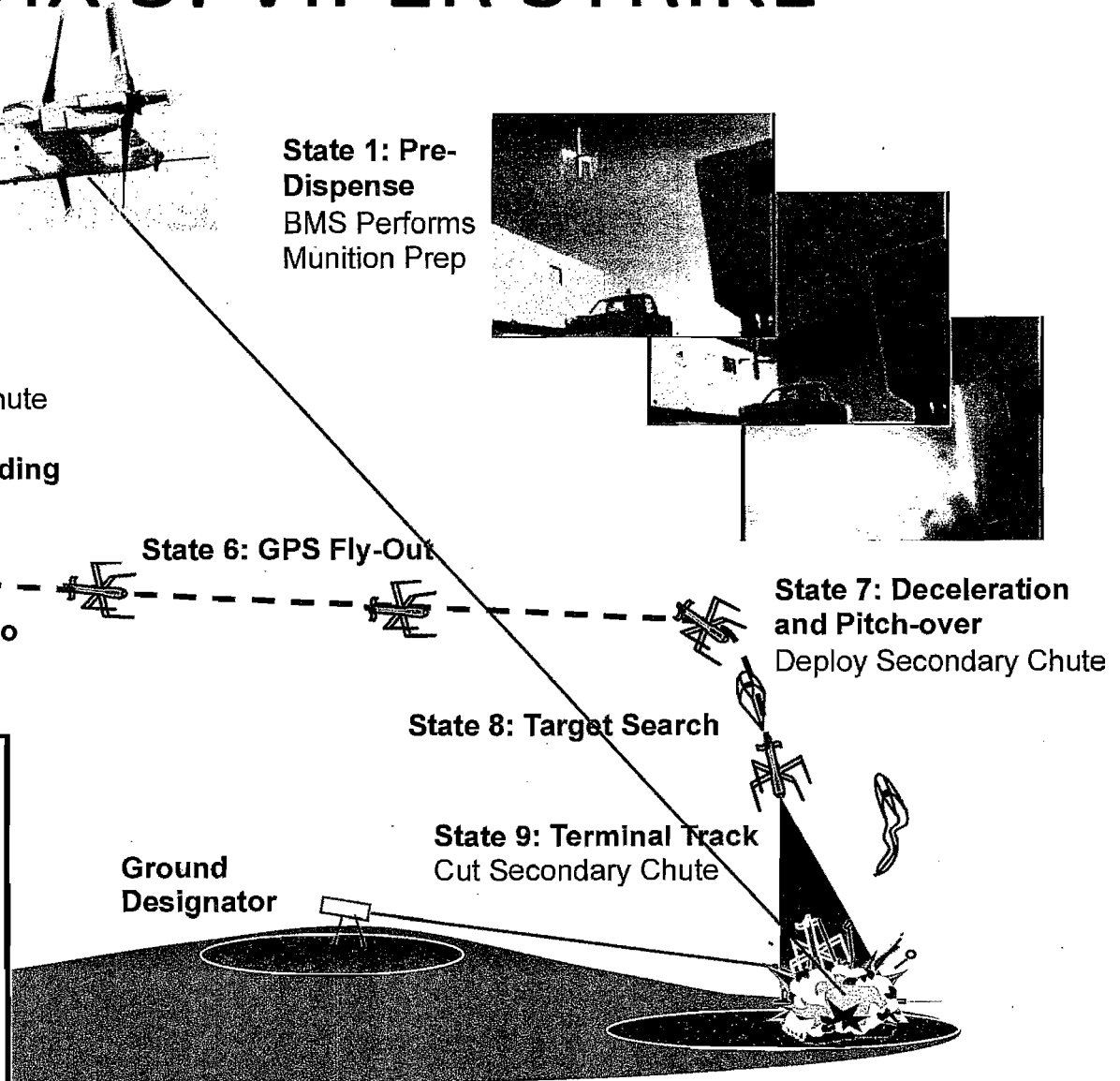
BMS Performs
Munition Prep

State 8: Target Search

State 9: Terminal Track
Cut Secondary Chute

State 7: Deceleration
and Pitch-over
Deploy Secondary Chute

- Size
 - 35 inches
 - 43 lbs
 - 2.2 lbs blast frag warhead
- Fuzing options (In-flight selectable)
 - Point Detonate
- Attack Guidance
 - GPS
 - Semi-active Laser



APPENDIX 4: M230LF

30mm M230 LF Chain Gun®

Automatic Cannon

PHYSICAL DATA

Length85.87 in
Width10.915 in
Height:11.37 in
Receiver Weight76 lb
Feeder Weight39 lb
Barrel Weight45 lb
Total Weight*160 lb
Recoil Naval1,650 lb

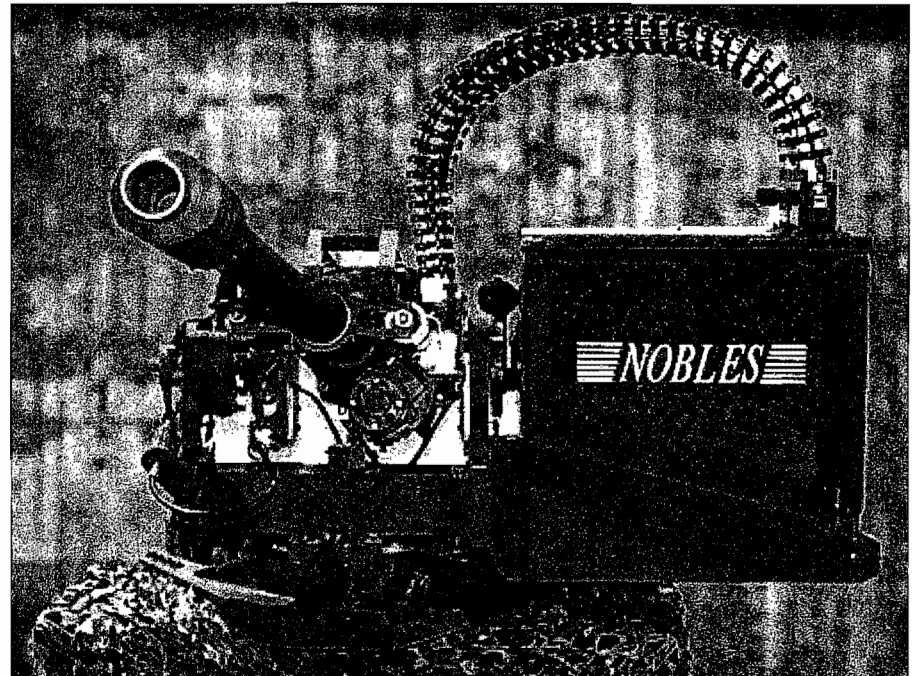
PERFORMANCE DATA

Rate of Fire 200 RPM

The M230 LF is a link feed version of the 30mm Apache helicopter Chain Gun® cannon. The weapon fires NATO standard 30mm ADEN/DEFA and M788, M789, M799 ammunition. The M230 LF is ideal for use on ground vehicles and patrol boats in turrets or remote weapon stations.

*Includes gun barrel, drive motor, recoil system and integral feeder.

(ATK Gun Systems pamphlet)



M230LF Viper Gun System

<http://www.cantinearmament.com/wp/>

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